**PART - I**

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<th>Paper Code</th>
<th>05</th>
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<tr>
<td>Subject</td>
<td>Civil Engg. - II</td>
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**PART - II**

Subject: Civil Engg. -II

<table>
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<th>05</th>
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<tr>
<td>Total Pages</td>
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<tr>
<td>Time</td>
<td>3 Hours</td>
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<td>Maximum Marks</td>
<td>200</td>
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**TO BE FILLED BY THE CANDIDATE**

<table>
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<th>Roll No. (In words)</th>
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<tr>
<td>Name of the candidate</td>
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<td>Date of Birth (DD/MM/YYYY)</td>
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<td>Father's Name</td>
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<td>Signature of the candidate</td>
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<td>Date of Examination</td>
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**Invigilator must check the Roll No. and Photo ID. of the candidate, then Sign. here:**

**TO BE FILLED BY INVIGILATOR**

If candidate found using unfair means then Invigilator should fill up this bubble with black/blue ball pen & report to the Centre Superintendent:
IMPORTANT NOTES

(A) Please fill up the OMR Sheet of this Question-Answer Booklet properly before answering. The question paper is divided into different unit and parts. The number of questions to be attempted and their marks are indicated in each unit and part.

(B) Attempt answers either in Hindi or English, not in both. For Language Papers, answer in concerned language and script, unless directed otherwise to write in Hindi or English specifically.

(C) If there is any sort of ambiguity/mistake either of printing or factual nature then out of Hindi and English version of the question, the English version will be treated as standard.

(D) If any candidate is found to be in possession of printed material other than the question paper, the candidate will be liable for that.

(E) It should be ensured that the Question-Answer Booklet is provided in a sealed envelope to the candidate.

(F) If any candidate is found to be in possession of printed material other than the question paper, the candidate will be liable for that.

Special Notes:

If there is any wrong information filled by the candidate or any attempt is made to damage it or any marking as identification is done, then his candidature for the entire examination shall be rejected by the commission, for which he will be liable.
PART - A

Note: Attempt all the twenty questions. Each question carries 2 marks. Answer should not exceed 15 words.

1. Define kinematic viscosity of a fluid.

2. Define Total Energy Line (TEL) in a fluid flow through a pipe line.

3. Write the expression for momentum thickness with proper notations.
4. A 30 m long tape is held between supports under a tension of 120 N. If the tape weighs 10 N, find the horizontal distance between the supports.

5. Define line of collimation.

6. What is the recommended camber range for bituminous surfacing in the case of light rain fall?

7. What do you mean by catchwater drain?
8. What is the use of location files and spot maps?


10. What is crop period?

11. What do you mean by aquitard?
12. How do you define surcharge storage of a reservoir?


13. What is a queen closer?


14. What do you understand by shoring?


15. What is the function of king post in a king post roof truss?


16. What is hacking?
17. What do you understand by Wing Walls?

18. Define traps.

19. A sewage sample having initial D.O. of 10 mg/l is incubated for 5 days at 20 °C. The final D.O. found after 5 days was 2 mg/l. If sewage is diluted to 5%, what would be the BOD₃ of the given sewage sample?

20. Define Coliform Index. (C.I.)
PART – B

Note: Attempt all the twelve questions. Each question carries 5 marks. Answer should not exceed 50 words.

21. Differentiate the backwater and drawdown curves obtained in steady gradually varied flow in a prismatic channel.

22. Define and explain briefly:
   (i) Flow net
   (ii) Streak line
23. Define the following terms:
   (i) Repeated
   (ii) Economical Span
   (iii) Clear span
   (iv) Pier
   (v) Carriage width
24. Write down the construction steps for water bound macadam road.

25. How does the practical profile of a low gravity dam differs from that of the theoretical one?
26. The gross commanded area for an irrigation canal is 15,000 hectares out of which 80 percent is cultural commanded area. The intensity of irrigation is 50 percent for rabi. If the kor period is 4 weeks for rabi, determine the (i) outlet discharge. The outlet factor for rabi may be assumed as 1800 hectares/cumecs. (ii) also calculate the delta for rabi.

27. Define optimistic, pessimistic and most likely time estimate.
28. What is D.O. sag curve? Explain it with neat sketch.

29. What is soundness of cement and how is it tested?
30. What are the various tests carried out on Bitumen? Mention uses of each test.

31. Define the following terms: Hip, Pitch, Eaves, Common rafter, Purlins.
32. The following were observed as the fore and back bearing of lines from a station: N34°45'E and S68°32'E. If the magnetic declination at the place is known to be 2¹15'W, find the true bearing of lines.
PART – C

Note: Attempt all 5 questions. Each question carries 20 marks. Answer should not exceed 200 words.

33. Two reservoirs with 15 m difference in their water levels are connected by a 300 mm diameter pipe line of 3000 m length. Calculate the discharge. If a parallel pipe line of 300 mm diameter is attached to the last 1500 m length of existing pipe, determine the modified discharge. Take only wall friction into account. Assume \( f = 0.04 \) in Darcy-Weisbach formula.
34. A road has a total width of 7.5 m including extra widening on curve and design speed of 60 km/h. Calculate the length of transition curve and its shift on this curve of 200 m radius. Allowable super elevation is 1 in 150 and pavement is rotated about centre line.
35. Design a regime channel for a discharge of 50 m$^3$/s with silt factor of 1.0 by Lacey’s theory, taking side slopes as 1H:2V.
36. A rapid sand filter is to be provided in a water treatment plant to process the water for a town with a population of 2,75,000. The water demand is 200 litres/capita/day. The rate of filtration is 15 m³/m²/hour. Allow 5% of filtered water for storage to meet the backwash requirements. Each backwashing period is of 30 min. Determine the number of filters required allowing one as a standby unit. The available surface area configuration of filter unit is 10 m × 4 m. Also compute the up-flow velocity and head loss to expand the bed to 0.66 m from its original undisturbed depth of 0.6 m. The porosity of the bed is 0.50, specific gravity is 2.5. The average particle size is 0.6 mm. The drag coefficient is 5.02. The flow is assumed to be transitional flow.
37. Find the dimensions of a combined trapezoidal footing for two columns A and B, spaced 5 metres centre to centre. Column A is 40 cm × 40 cm in size and transmits a load of 900 kN. Column B is 30 cm × 30 cm in size and carries a load of 600 kN. The maximum length of footing is restricted to 7 metres only. The safe bearing capacity of soil may be taken as 120 kN/m².